

ACS

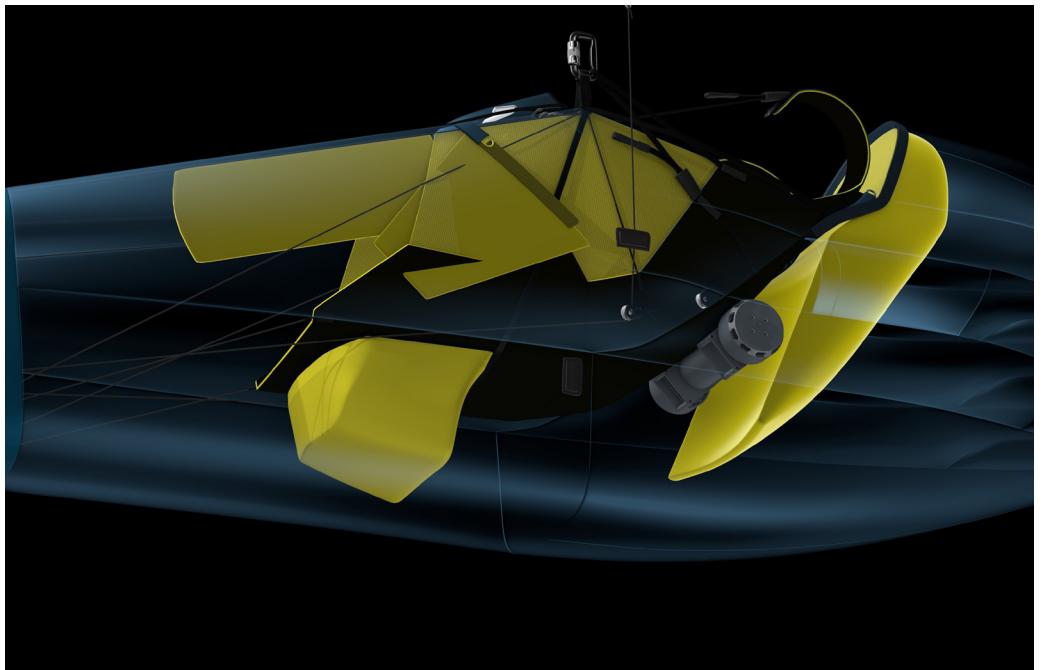
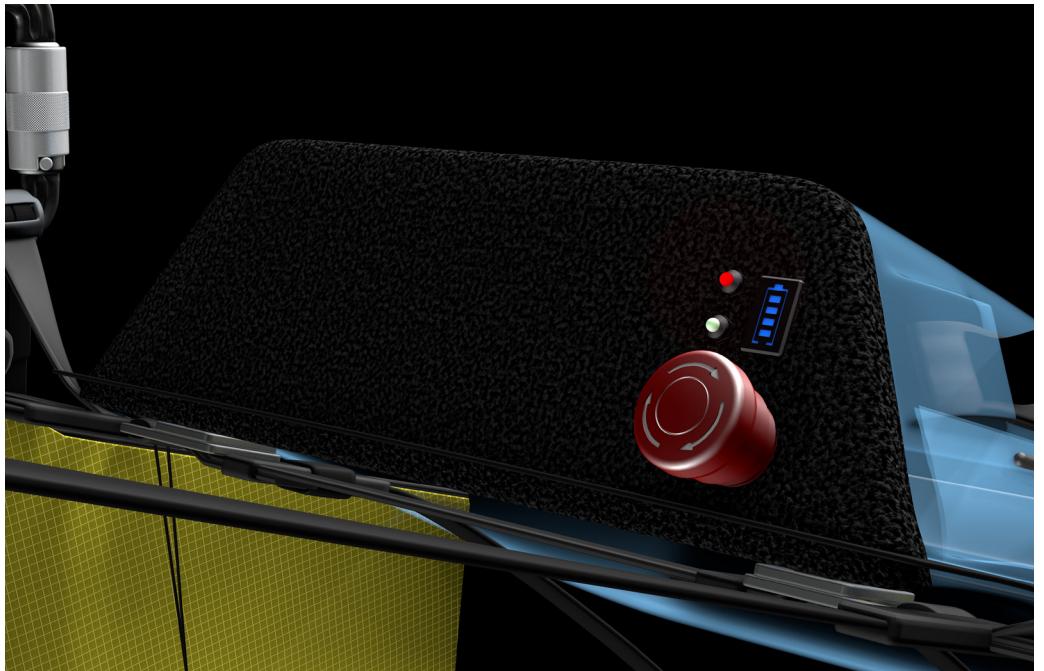
Anti Collapse System

Introduction

The Anti Collapse System (ACS) is a new technology envisioned by Jean-Baptiste Chandelier and designed by Thomas Pierre-Bes. It serves to prevent any collapse of the paraglider, with a level of reactivity far beyond that of paraglider pilots. The ACS responds to all types of collapses.

For the pilot, no special action is required. They can continue to fly as usual, and the ACS guardian angel will activate only when necessary, even before the pilot has time to sense the collapse.

On the right, you can see what the ACS system would look like integrated into a harness for a production version.

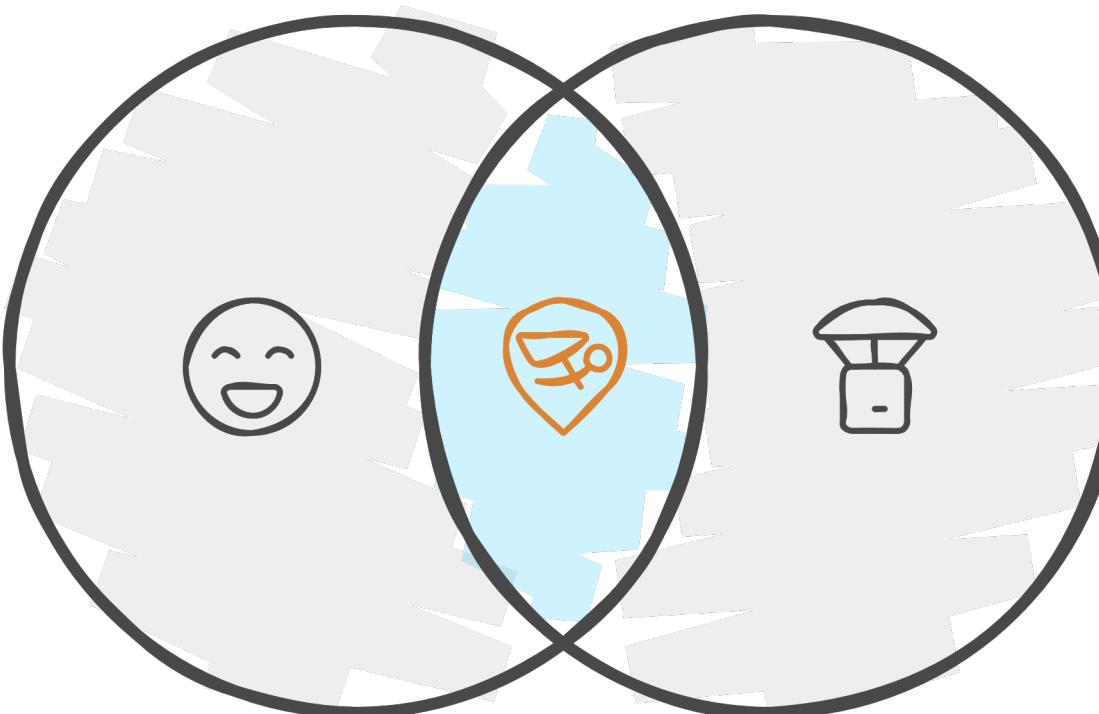


Goal

Democratize Paragliding

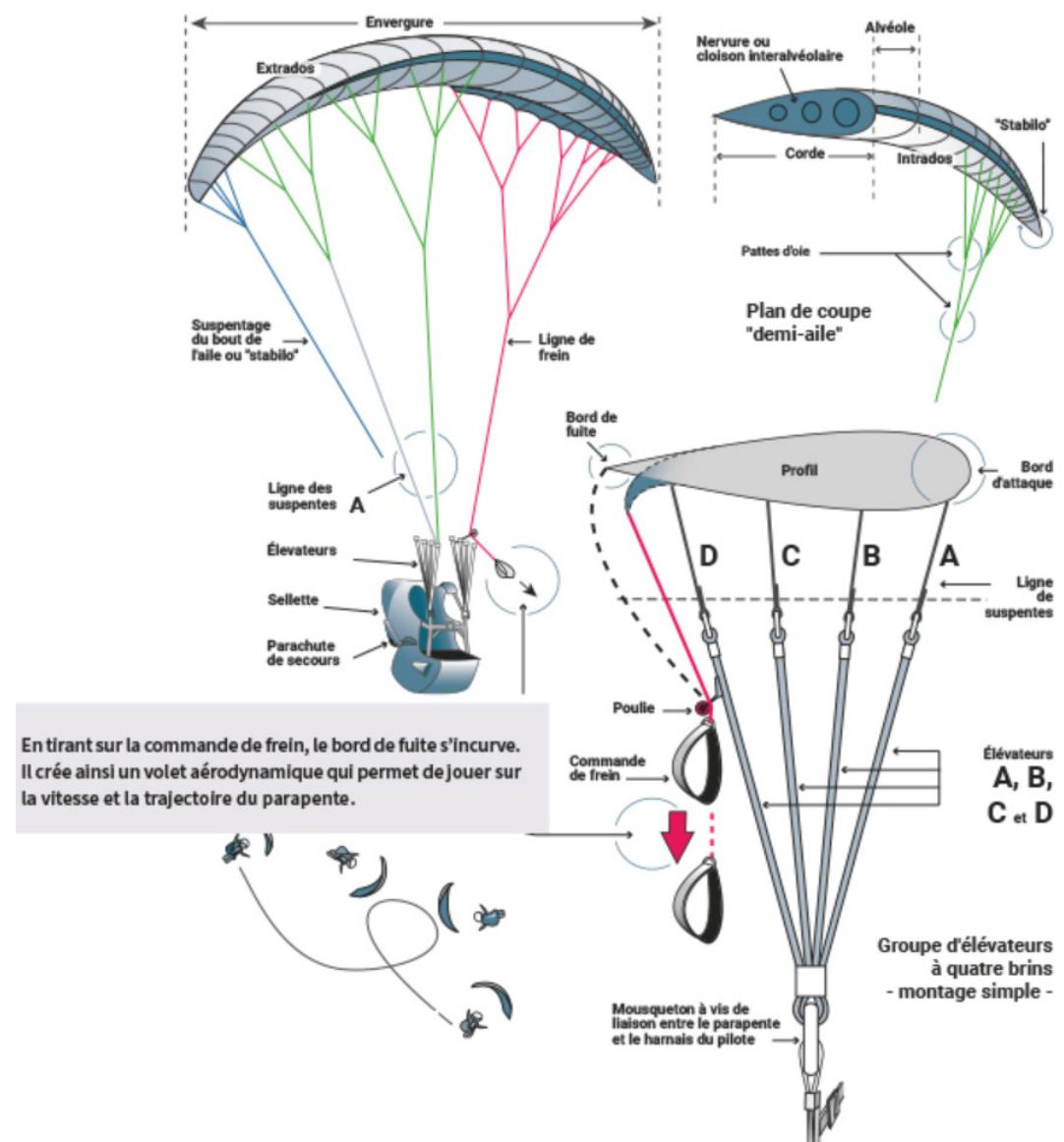
Easier

Safer



Paragliding Vocabulary

Français	Anglais
Envergure	Wingspan
Extrados	Upper Surface
Suspente	Line
Élevateurs	Risers
Suspente du bout de l'aile	Stabilo Line
Ligne de frein	Brake Line
Sellette	Harness
Parachute de secours	Reserve Parachute
Bord de fuite	Trailing Edge
Bord d'attaque	Leading Edge
Profil	Airfoil Profile
Corde	Chord
Intrados	Lower Surface
Alvéole	Cell
Nervure	Rib
Pattes d'oie	Gooseneck Connections
Commande de frein	Brake Handle
Pouille	Pulley
Mousqueton à vis	Screw-gate Carabiner
Groupe d'élevateurs	Set of Risers

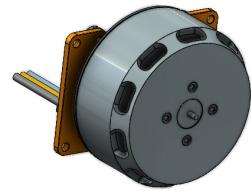


Presentation

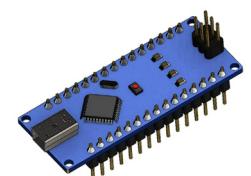
prototype V1



every A line have a sensor



electric motor & ESC



Arduino



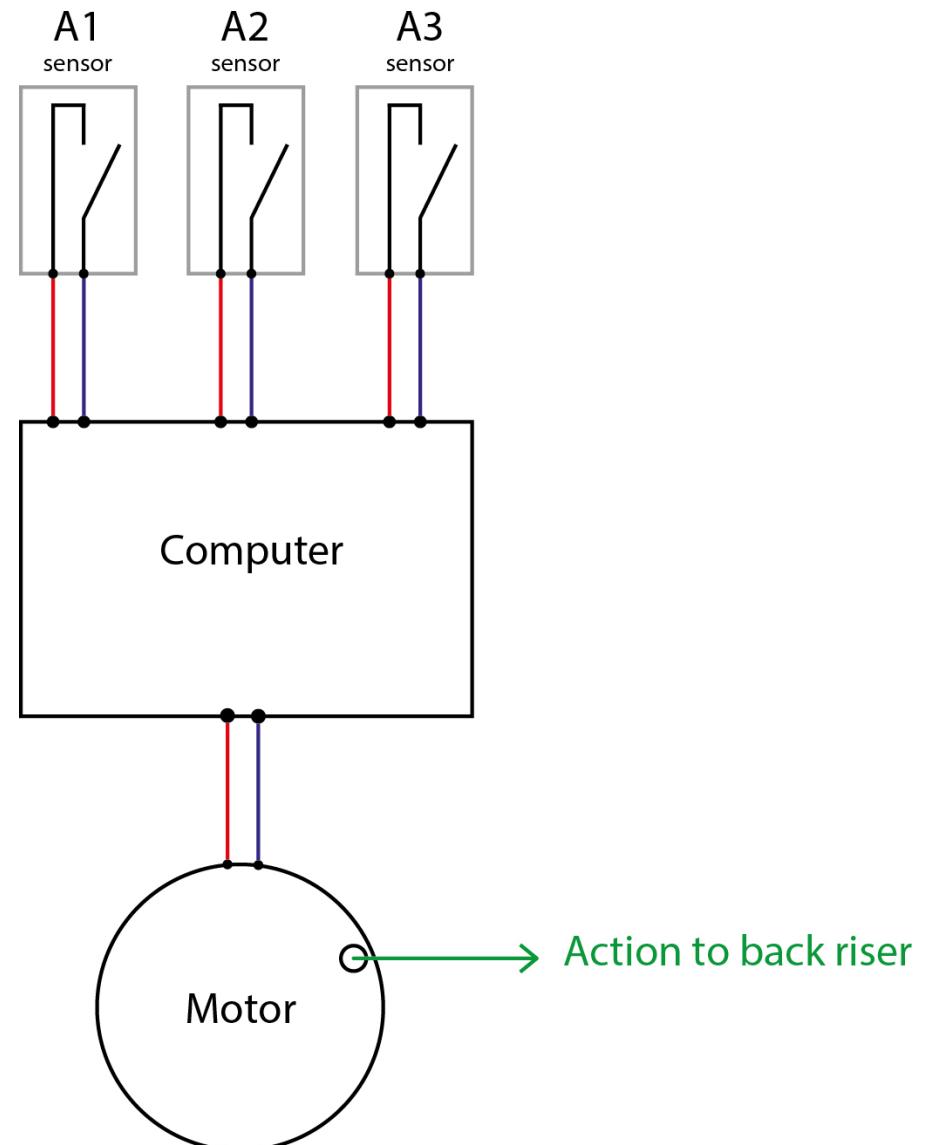
Battery lipo 6s



Presentation

How does it work?

The ACS detects if one of the A sensors senses a lack of tension in one of the A lines. The motor will react 0.05 seconds later, pulling the rear riser for a maximum of 0.8 seconds or until all tensions are restored. This action on the rear riser neutralizes the collapse, reopening the wing even before the collapse occurs.



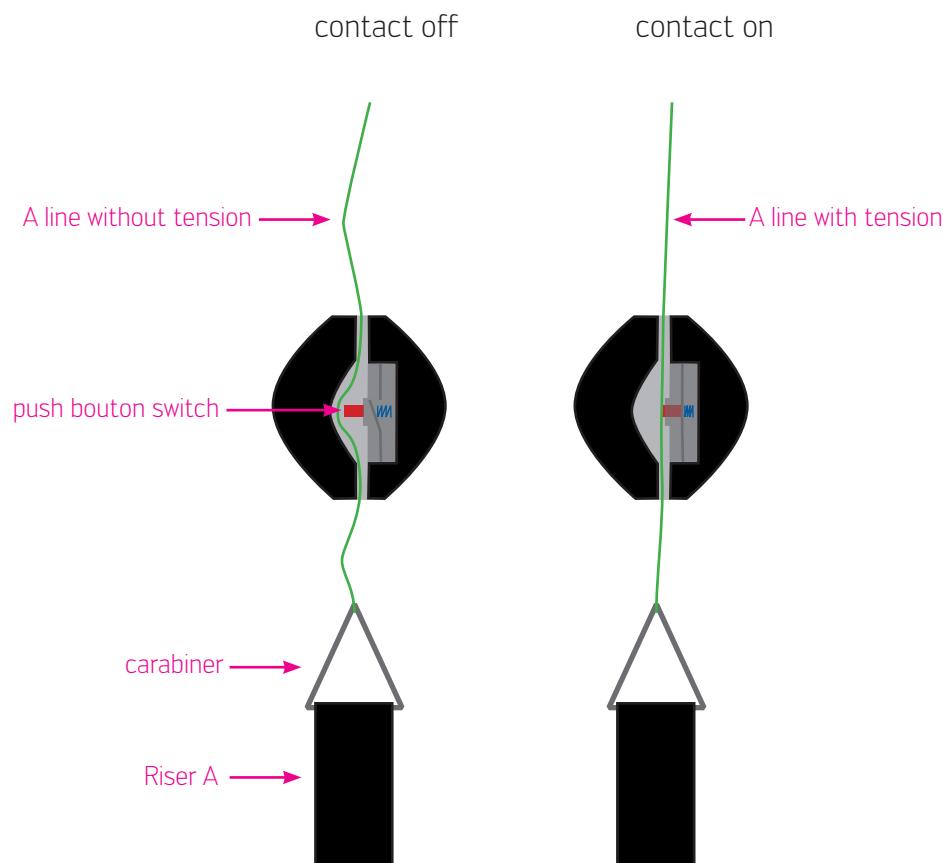
Presentation

The sensor

The ACS sensor is operated solely by a push-button contactor.

When the line is energized, it presses the push button and activates the contactor.

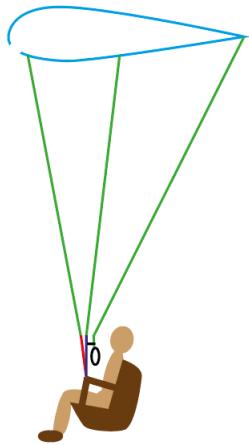
When the line is de-energized, it deactivates the contactor.



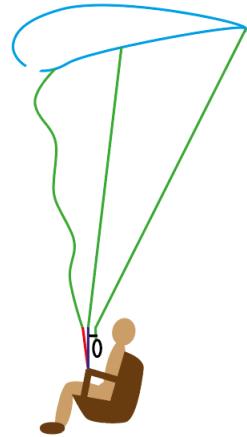
Collapses

collapse description

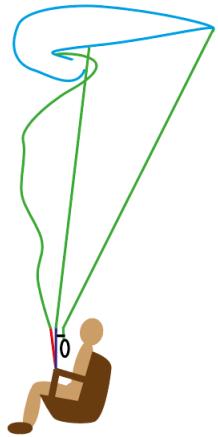
stabilized flight



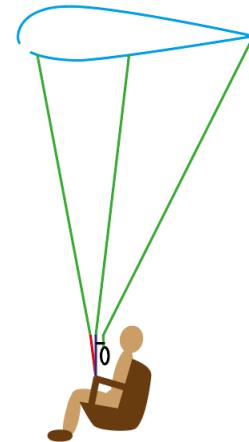
the leading edge start to go down,
The front line (A) release the tension



The wing folds, and the leading edge goes under the canopy.



The wing recovers its shape naturally, or thanks to the pilot's action.



A collapse can cause various flight incidents, such as autorotation, a cravat, or twists, and can potentially lead to an accident.

Collapses

different types of paragliding collapses

The ACS has the ability to stop any type of collapse thanks to its sensors located on each A line. Even the most dangerous closures, such as «shrimp collapse» are managed by the system.

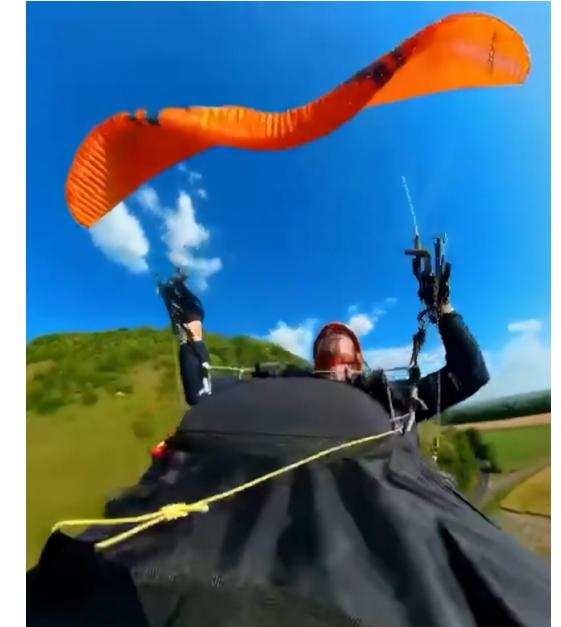
front collapse



assymetric collapse



shrimp collapse

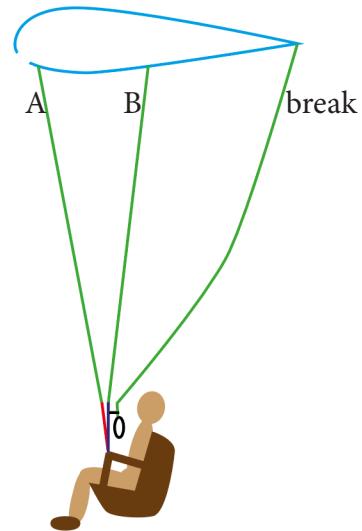


Collapses controlled by ACS

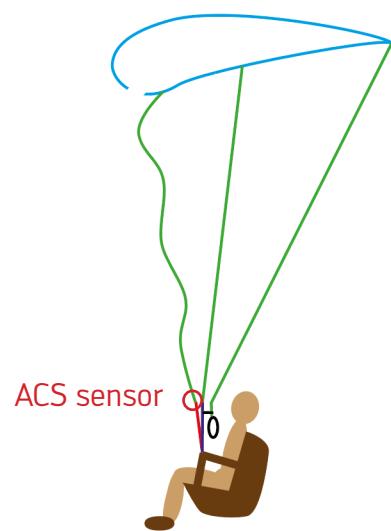
global concept

The ACS creates an action to increase the angle of attack by raising the wing, deforming the profile, or generating drag.

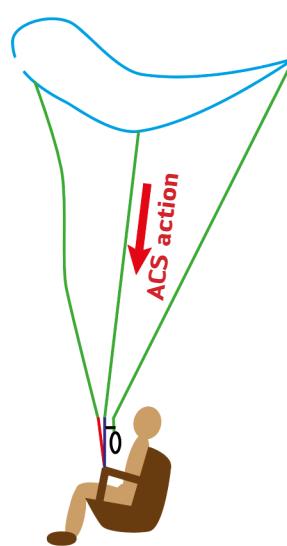
standard flight



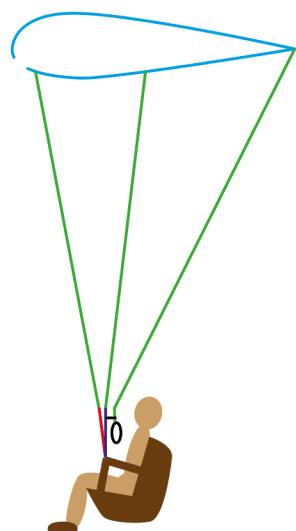
The ACS sensors detect the onset of a collapse.



ACS correction to prevent the collapse



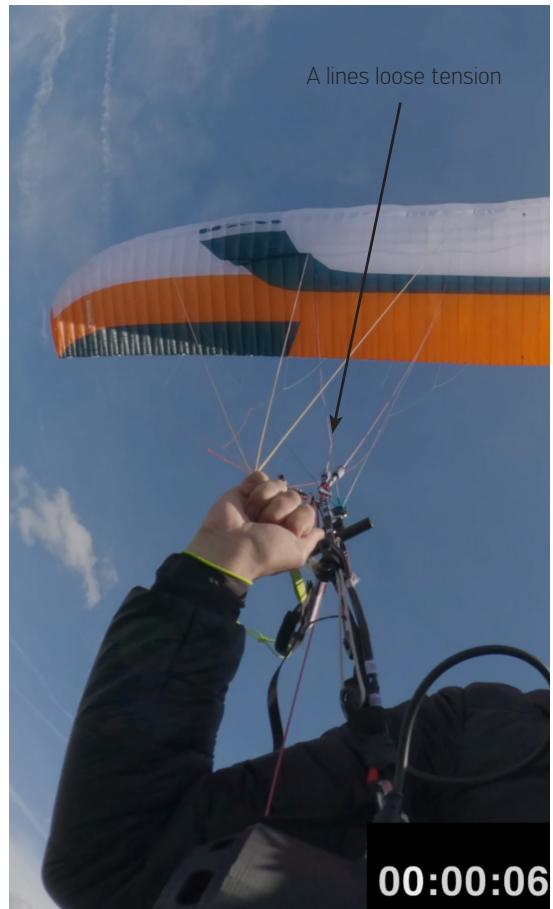
return to standard flight



Presentation

Demonstration

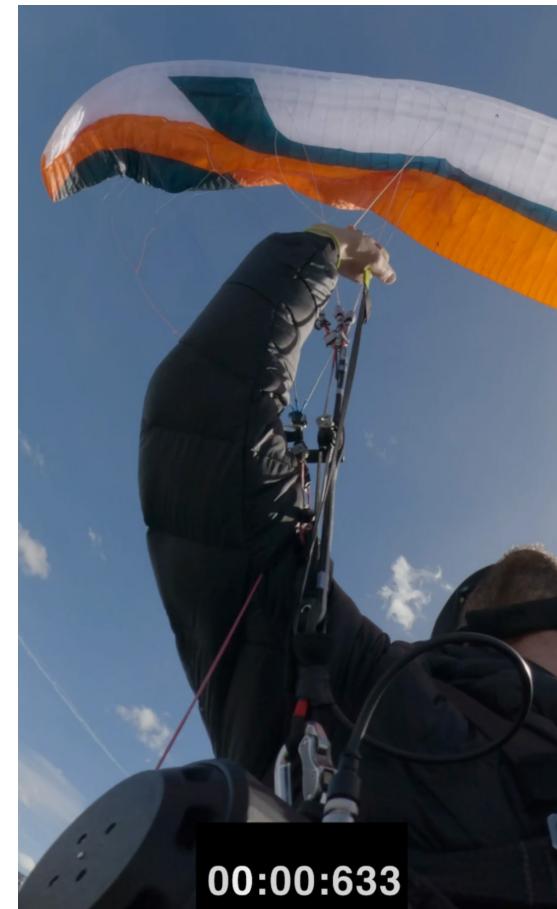
The A line releases tension.



0.2 seconds later, the ACS is already fully activated

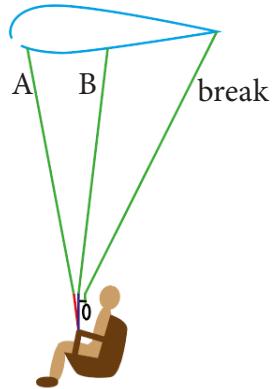


0.6 seconds later, the ACS releases the tension because the A line tension is back.

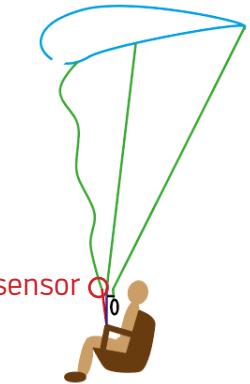


ACS concept on different wings

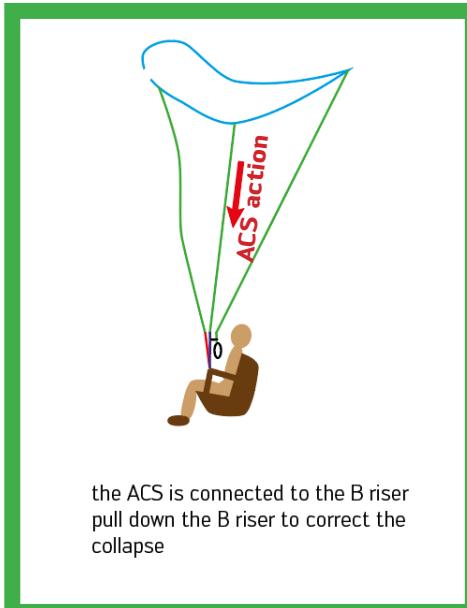
concept for a 2 liner paraglider



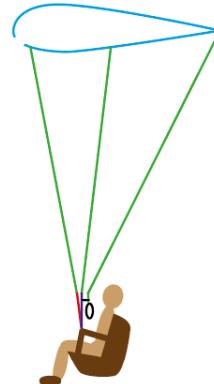
The lines connected to the leading edge are taut.



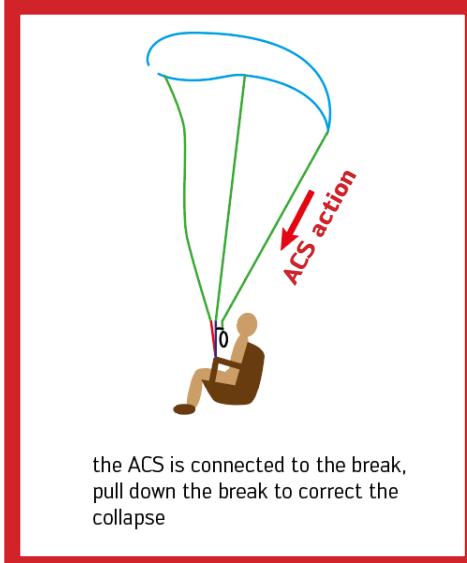
The ACS detects a lack of tension on a front line.



the ACS is connected to the B riser,
pull down the B riser to correct the
collapse



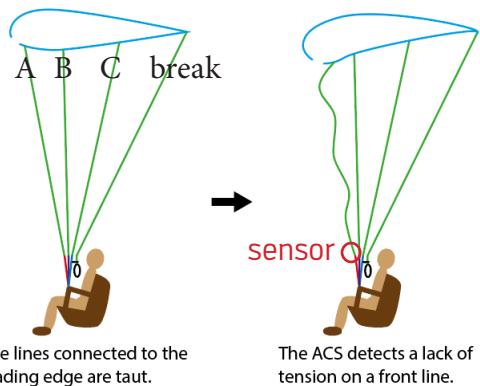
Back to normal flight



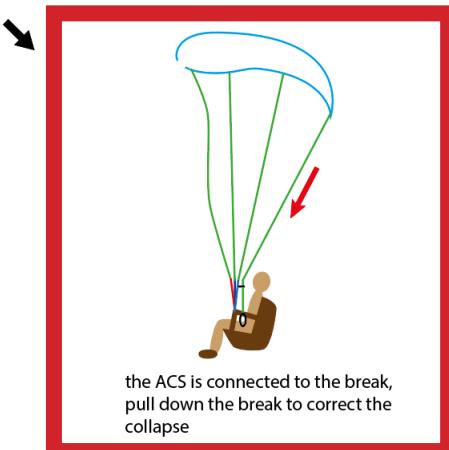
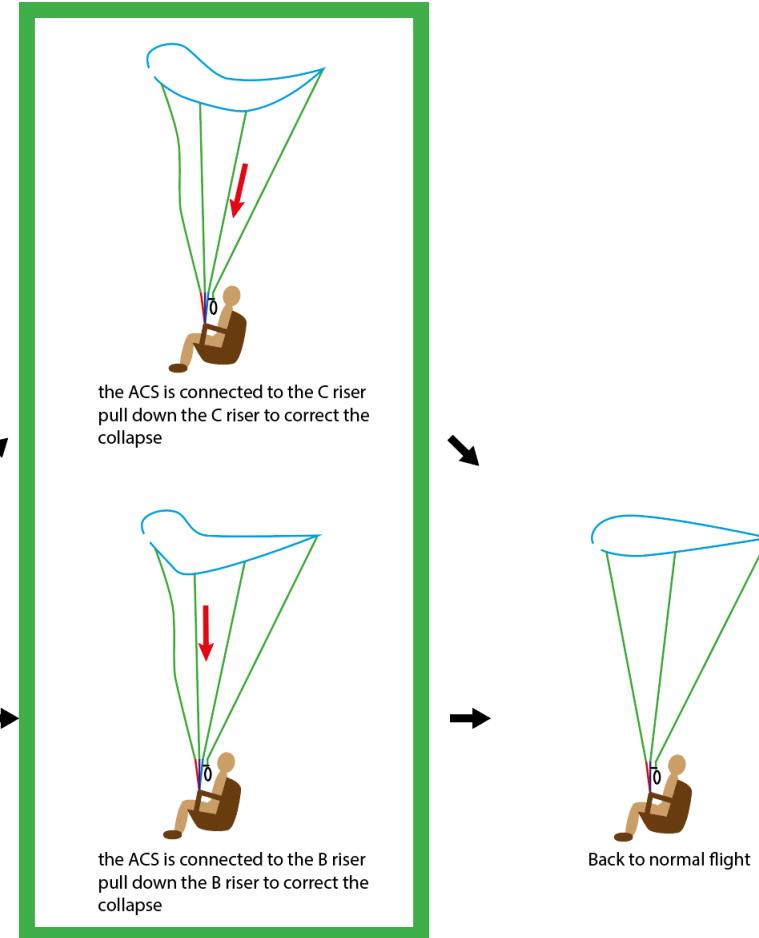
the ACS is connected to the break,
pull down the break to correct the
collapse

ACS concept on different wings

concept for a 3 liner paraglider

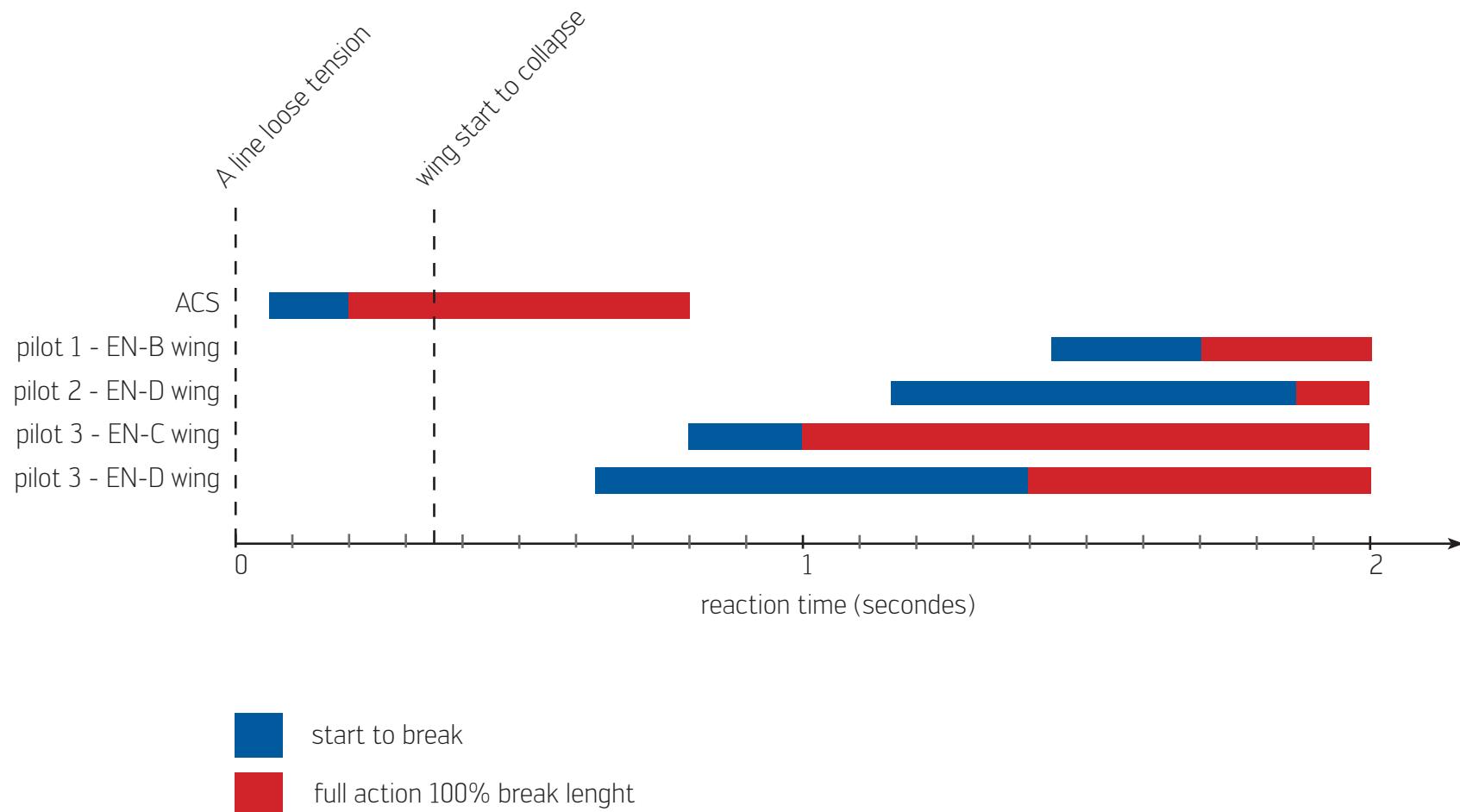


The ACS detects a lack of tension on a front line.



Efficiency

ACS vs Human



Specification

main pieces

Component	Specification	Value
ACS specification	Fully Charged Operating Voltage	25.2V
	Minimum Set Voltage	18V
	Maximum Operating Current	96A
	Maximum Battery Discharge Current	169A
	Programmed Rotational Speed	10 RPS
	Line Travel Speed	3.23ms
	System Responsiveness	50ms
	Maximum Motor Run Time	800ms
	Minimum Interval Between Commands	300ms
Battery	Brand/Model	TATTU R-Line Version 4.0 1300mAh 6S 130C
	Capacity	1300mAh (1.3Ah)
	Voltage	22.2V (6S, 3.7V per cell)
	Power	28.86Wh
	Discharge Rate (C)	130C
	Maximum Current	169A
	Battery Type	Lithium-Polymer (LiPo)
	Weight	Approximately 215g
Motor	Brand/Model	ODrive M83255 100KV
	KV	100
	Diameter	92mm
	Weight	840g
	Pole Pairs	20
	Maximum Current	Depends on ESC and load
ESC motor controller	Brand/Model	ODrive S1
	Operating Voltage	12-48V (max 50.5V)
	Continuous Current	40A
	Peak Current	80A
	Brake Resistor	2 ohm, 50W
	Control Interface	USB, UART (isolated), STEP/DIR (isolated), Analog Voltage, PWM, CAN
	Encoder Support	Absolute encoders, quadrature, hall, SPI, RS485
	PWM Frequency	24kHz
	Control Loop Frequency	8kHz
	Dimensions	66mm x 50mm
	Weight	35g (without screw terminals), 55g (with screw terminals)
	Additional Features	Built-in motor thermistor, Web GUI support

Specification

piece liste / cost / weight

Anti Collapse System Part List (Half-Wing)

Art	Country	web Link	Shipping	Packing Qty	Real Qty	PU.HT	PU.TTC	Total HT	Comments	Weighting
Motor with encoder magnet - M83255 100KV	USA	Motor with	66,07 €		1	1	149,00 €	225,00 €	149,00 €	840
Brake resistor 50W2RJ	USA		0,00 €		1	1	0,00 €	0,00 €	0,00 €	22,8
Odrive S1	Europe	ODrive S1 –			1	1	149,00 €	189,81 €	149,00 €	55
Pancake motor plate	Europe	Pancake Mc			1	1	12,00 €	14,28 €	12,00 €	100g
Heat speader plate for Odrive S1	Europe	Heat Spread			1	1	12,00 €	14,28 €	12,00 €	100g
Thermal pad (5 PCS)	Europe	Set of 5 The			0,2	1	1,80 €	2,14 €	0,36 €	Select size Odrive S1
Harness build kit for odrive S1 (2 connectors)	Europe	Harness Bui			0,5	1	9,00 €	10,71 €	4,50 €	18
Indicateur de capacité de batterie	China	Indicateur d	0,78 €		1	1	1,69 €	1,69 €	1,69 €	Select 6S Blue
Connecteur M12 female 4Pin (5PCS)	China	Commande	0,00 €		0,2	1	12,47 €	12,47 €	2,49 €	Select female 4Pin
Cable M12 male 4Pin	China	Connecteur	2,36 €		1	1	1,62 €	1,62 €	1,62 €	Select straight male 4p
Connecteur M12 male 4Pin (5PCS)	China	Connecteur	0,00 €		0,2	1	12,50 €	12,50 €	2,50 €	Select male 4Pin
Cable M12 female 4Pin	China	Connecteur	4,22 €		1	1	1,63 €	1,63 €	1,63 €	Select straight female 4p
Seat pressure sensor	Europe	YYRL Capteu	0,00 €		1	2	10,15 €	12,69 €	20,30 €	16
Fil plaqué argent 28AWG	China	DeliWire-Câ	0,00 €		0,2	0,2	4,98 €	4,98 €	1,00 €	Select Clear, 5 Meters, 28AWG 0.8mm Sq0.08
Diode rectifier 1N4007	China	Redresseur	1,85 €		0,01	1	1,32 €	1,32 €	0,01 €	0,3
Pull Up resistor 10K ohms	China	Résistances	1,99 €		560	2	0,002464	0,002464	1,38 €	Select 10K
104pf ceramic capacitor	China	/05/2019 en	2,02 €		100	0,02	0,0027 €	0,0027 €	0,0054 €	0,3
Led 5MM RED	China	T2T-Kit assre	2,98 €		10	0,1	0,045 €	0,045 €	0,045 €	Select 10pcs RED
Led 5MM GREEN	China	T2T-Kit assre			10	0,1	0,045 €	0,045 €	0,045 €	Select 10pcs GREEN
Voltage regulator LM2596	Europe	Senven 10 P	0,00 €		10	0,1	1,1136	1,392 €	1,114 €	10
Arduino nano générique ELEGOO (3PCS)	Europe	ELEGOO 3 P	0,00 €		0,33	1	19,99 €	24,99 €	6,60 €	4
Connecteur XT60 male (10PCS)	China	Connecteur	0,63 €		0,1	1	2,86 €	2,86 €	0,29 €	Select male 10PCS
Fil 14AWG silicone RED (1m)	China	Fil de câble	0,00 €		0,3	0,3	1,62 €	1,62 €	0,49 €	Select 14 AWG 1 meter
Fil 14AWG silicone BLACK (1m)	China	Fil de câble	0,00 €		0,3	0,3	1,62 €	1,62 €	0,49 €	Select 14 AWG 1 meter
Gaine thermo diamètre 1,5mm black (2m)	China	https://fr.ali	0,00 €		0,05	0,05	0,71 €	0,71 €	0,04 €	
Gaine thermo diamètre 3mm black (2m)	China	https://fr.ali	0,00 €		0,05	0,05	0,77 €	0,77 €	0,04 €	
Gaine thermo diamètre 5mm black (2m)	China	Gaine de câ	0,00 €		0,05	0,05	0,93 €	0,93 €	0,05 €	
Emergency stop button	Europe	Gebildet Int	0,00 €		1	1	11,19 €	13,99 €	11,19 €	40
Ring 9x13x2	Skywalk				2	2				1,74
Loctite super glue 3 (for fix rings)										
Micro switches (10PCS)	Europe	InduSKY Lot	0,00 €		0,1	1	7,19 €	8,99 €	0,72 €	0,8
Micro buttons (20PCS)	Europe	Chanzon Mi	0,00 €		0,15	3	3,99 €	4,99 €	0,60 €	Select 4pin, TS-D001 and B 5mm 20pcs
Vis Inox M4X20 (10PCS)	China	Capuchon h	0,00 €		0,7	7	2,36 €	2,36 €	1,65 €	16,38
Vis Inox M4X8 (10PCS)	China	Capuchon h	0,00 €		0,4	4	1,43 €	1,43 €	0,57 €	6
Vis Inox M3X8 (50PCS)	China	DIN 912 En			0,12	6	0,71 €	0,71 €	0,09 €	4,8
Vis Inox M3X6 (50PCS)	China	DIN 912 En	2,08 €		0,12	6	0,67 €	0,67 €	0,08 €	3,84
Vis inox M2x6 (100PCS)	China	DIN 912 Acier	1,75 €		0,02	2	1,44 €	1,44 €	0,03 €	0,56
Insert a chaud M2 (OD3.5mm / lenght 4mm 50PCS)	China	M2 M2.5 M			0,04	2	1,24 €	1,24 €	0,05 €	0,36
Insert a chaud M3 (OD4.2mm / lenght 5mm 50PCS)	China	M2 M2.5 M	1,86 €		0,24	12	1,43 €	1,43 €	0,34 €	1,56
Insert a chaud M4 (OD6mm / lenght 5mm 30PCS)	China	M2 M2.5 M			0,37	11	1,73 €	1,73 €	0,64 €	8,8
Esun ABS+ (1kg)	Europe	eSUN ABS+	0,00 €		0,5	0,5	15,99 €	19,99 €	8,00 €	500
Lipo tattu R-line 1300mah 6S 130C	Europe	Batterie Lip	0,00 €		1	1	31,92 €	39,90 €	31,92 €	200
Total			109,09 €				490,17 €	638,98 €	424,55 €	1964,40 Gr

Market

Which category might be interested in the ACS?

School market



local flight market



XC market



Hike and fly market



EN-A wing



EN-B wing



EN-C wing



EN-D wing



CCC wing



Acro wing



Market

Can ACS Solve Paragliding Stress Issues?

Stress is a major concern in paragliding. Pilots need to balance their passion for flying with the stress related to safety. When stress levels become too high, pilots gradually stop flying.

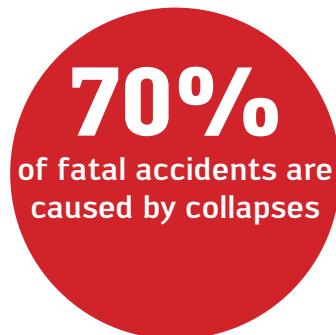
The ACS system aims to alleviate this stress for paragliding pilots. To understand the market better, I conducted a survey on social media to gauge pilots' feelings about stress during cross-country (XC) flights.



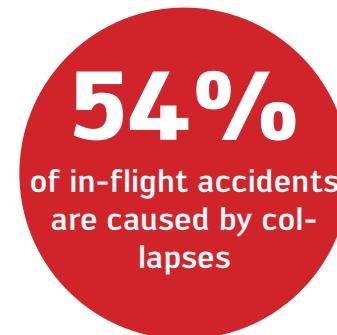
Market

Can ACS solve paragliding accidents?

Accidentology in 2023



In the world, 110 pilots will
die this year because of a
collapse.



In the world, 591 pilots will
have an accident because
of a collapse.

Conclusion

We think we have a unique opportunity to transform paragliding into a more accessible, less anxiety-inducing, and significantly safer sport. The ACS represents a major technological advancement that allows us to improve the safety of our canopies. Having complete control over this revolutionary technology could position us as leaders in our field.

Beyond the numbers and the excitement generated by this innovation, the ACS has the potential to save lives. By continuing our research in ACS, we can reduce risks and prevent the loss of incredible talents and dear friends in the sport we love so much. Paragliding will always be a sport with inherent dangers, but together, we can make each flight safer and offer greater peace of mind to all paragliders and maybe write a new chapter in the history of paragliding.

Jean-Baptiste Chandelier



As I create this file, my thoughts are with Timo Leonetti, a 22-year-old pilot who tragically died after a collapse at the French Championship.